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Water Environment Evaluation for
Inland Sea by Principal Component Analysis

Quarterly Report for LANDSAT-2 Project

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ABSTRACT

Water environment evaluation has been done for the inland sea in Japan, by using the principal component analysis. LANDSAT MSS digital data for two different dates, Nov. 12, 1972 and Dec. 30, 1975, were utilized for the comparative study.

The results shows that the comprehensive evaluation for the water environment could be made by combining the first principal component with the second principal component.

The computer generated dot map includes the distribution of the polluted water or turbid water in the inland sea.

INTRODUCTION

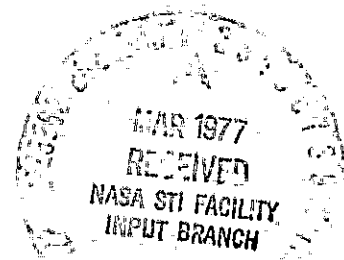
The inland sea in Japan, has been popular with the national park and the fishery since the ancient. However the reclamation for the industry and industrial land use has increased rapidly to pollute the water environment of the inland sea since ten or fifteen years ago.

The comprehensive evaluation for the water environment for the whole area of the inland sea should be appreciated to be monitored for the water pollution. The objective of the study is to provide the environmental manager of the environmental protection agency with the comprehensive water environmental evaluation map for the inland sea, from the LANDSAT MSS digital data processing.

PRINCIPAL COMPONENT ANALYSIS

The principal component analysis were tested for the LANDSAT MSS data of two different dates Nov. 12, 1972 and Dec. 30, 1975.

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2 P HC A52/EF A01

The result of the principal component analysis shows that the first principal component corresponds to the total radiance of four bands, which enhances the turbid water, whereas the second principal component corresponds to the difference between the visible radiance and the infrared radiance which enhances the organic matter on the water surface.

COMPREHENSIVE EVALUATION FOR WATER ENVIRONMENT

The comprehensive evaluation for the water environment were made by the criteria which was established by combining the first principal component with the second principal component as shown in the Figure 1.

The computer generated dot map were made which shows the water environment for the inland sea including the distribution of the polluted water.

Rank	Range	First Principal Component (Turbid Water)	Second Principal Component (Organic Matter)
1	$Z < -1.5$	very low	very high
2	$-1.5 < Z < -0.5$	low	high
3	$-0.5 < Z < 0.5$	normal	normal
4	$0.5 < Z < 1.5$	high	low
5	$1.5 < Z$	very high	very low

'Z: Score of Principal Component

Fig. 1 (a) Rank of the Principal Component

Rank of Z_1 \ Rank of Z_2	1	2	3	4	5
1			B	A	A
2		D	C	B	A
3	D	C	C	C	C
4	E	D	C	D	
5	E	E	C		

A: very clear

B: clear

C: little polluted

D: polluted

E: highly polluted

Fig. 1 (b) Criteria for Water Environment